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As a result of the tremendous increase in the need for new, well-planned college facilities, the Council of Educational Facility Planners proposes guidelines for the conception, planning, and implementation of such facilities. Major content areas are: (1) Concepts of Vocational-Technical Education, (2) Groups Served by Vocational-Technical Education, (3) Patterns of Vocational-Technical Education, (4) Facility Planning Considerations, (5) Factors Affecting Design and Usefulness, (6) Facility Support Factors and (7) Shops and Laboratories. Patterns of vocational-technical education at the comprehensive, area vocational schools, combination secondary-post secondary institutions, and the regional service center are described. Facility planning considerations include survey, site selection, community attitudes, types and levels of curriculum, and occupational analysis. Other chapters cover equipment selection, adaptability, supporting educational facilities, and the location, types, and sizes of shops and laboratories. (FP)

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VOCATIONAL - TECHNICAL
FACILITIES FOR
SECONDARY SCHOOLS:

A Planning Guide

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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SECONDARY SCHOOLS:

A Planning Guide

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by

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COUNCIL OF EDUCATIONAL FACILITY PLANNERS
Columbus, Ohio.
October, 1968

PREFACE

The nature and content of this manual prepared by the eminent vocational-technical educator, Dr. Joseph T. Nerden, is excellent evidence of the more recent substantial progress being made in vocational education. To say that such a publication is long overdue is an understatement.

Early efforts in establishing vocational education facilities often placed them in the school basement or in an abandoned elementary school. Too often the joining of two standard classrooms for shop or laboratory use was considered an ideal arrangement. A specially designed facility for occupational training at the secondary level was a rarity among architects and school building planners. Other early architectural efforts to design and build a modern vocational education facility in a new comprehensive high school building placed the shops or labs in a wing or other separate section of the main building thus precluding any possibility of expansion or change without destroying the original design of the building. It was through this kind of early vocational education facility planning that vocational education often got the label of a "dumping ground".

It is most heartening to educators and vocational educators alike to see the tremendous strides that vocational education facility planning and construction has made in recent years chiefly through the provisions of the Vocational Education Act of 1963 (P.L. 88-210), and the 1968 Amendments. This Act, for the first time in Federal vocational education legislation over a period of 50 years, provided that Federal funds could be used on a 50-50 project matching basis for the construction of area vocational-technical facilities. As a result, dramatic growth of Vocational Education programs has taken place in the addition of more than 200 new area schools of one type or another each year since 1964.

More than $100 million of federal, state and local funds are being expended each year for new construction, a vast and valuable investment in occupational education for many youths and adults in the United States. Every state is now involved in the planning and construction of new modern vocational education facilities.

As the construction of vocational education facilities continues at a rapid pace, the application of the many principles and recommendations contained in this publication will do much to improve the image of vocational-technical education.

Walter M. Arnold, Ed.D.
Director
Pennsylvania Vocational Study

FOREWORD

This publication is one of two such documents created by the Council of Educational Facility Planners under contract with the United States Office of Education, Department of Health, Education and Welfare. Broadly, the development of these guides were referred to as "Publications for Effective Planning" or the "PEP" Project.

As a result of the tremendous increase in the needs of many communities for new, well-planned college facilities, and with the vast expansion of the educational program as a result of the Vocational Education Act of 1963 and the 1968 Amendments, the Council of Educational Facility Planners proposed the publication of several expert guidebooks to the conception, planning and implementation of such facilities.

Originally contracted in 1967, the Council at that time was known as the National Council on Schoolhouse Construction. In October, 1967, the Council changed its name to the Council of Educational Facility Planners (CEFP). The Council continued to develop the "PEP" Project publications on what were considered to be the most pressing needs in the educational facility field.

The contract between the USOE and CEFP called for the services of a broadly representative voluntary advisory committee, under the leadership of the CEFP Executive Secretary and a USOE representative. Also serving on the committee was an architect, an educational consultant, a planning consultant, a professor of education, and a college administrator. The Publications Committee of CEFP was also represented on the Advisory Committee.

The Advisory Committee selected the professional writing services of outstanding experts in the fields of Community College planning and in Vocational-Technical Education to develop and prepare the original manuscript and to conduct field observations and related research.

As further stipulated in the contract, the Advisory Committee also employed several professional experts in communication graphics to organize the material for graphic design, format, and illustrations.

The Advisory Committee met several times with the various members of the production team for orientation and review. The final publications, which represent a team effort rather than the views of any individual, bears the approval of the Board of Directors of CEFP, with the final editing completed by the Bureau of Research, the United States Office of Education.

The Council would like to extend its appreciation and thanks to the many individuals whose participation and efforts made these publications possible. Among those deserving particular credit are the writers, Dr. Grant Morrison (Guide to Planning Community Colleges) and Dr. Joseph T. Nerden (Vocational-Technical Facilities for Secondary Schools); to Mr. James E. Klepser for final editing and graphic design, and Mr. William E. Turner for the illustrations; to Mr. Richard A. Elmendorf of the Bureau of Research who was the contracting officer; and, to the following members of the "PEP" Project Advisory Committee: Dr. Kenneth R. Widdall (Chairman), Dr. Donald Davis, Dr. Carroll W. McGuffey, Dr. William D. McClurkin, Mr. Leslie N. Boney, AIA, and Dr. William W. Chase, USOE Representative.

Dwayne E. Gardner
Executive Secretary
Council of Educational
Facility Planners

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CHAPTER 1. THE CONCEPTS OF VOCATIONAL-TECHNICAL EDUCATION

Introduction

During the previous two decades so many great technological advances have been made on so many fronts that it would be trite to further discuss the impact of these changes on life in every city and community of the United States. Federal legislation, military efforts, reports emanating regularly from the United States Department of Labor, concerns of the National Association of Manufacturers and many other national, state and local agencies, pour out information regularly concerning the needs for persons having both manipulative skills and technical knowledge for the world of work. Many high school students are impressed with information coming to them daily through the newspapers, radio, television and other means of communication, and are themselves concerned as never before with the potentials for them in the years ahead.

Probably no agency has had greater effect on the need for choosing occupations by high school students, in cooperation with their teachers and parents, than the Congress of the United States. Through current legislation, which enables the U.S. Department of Health, Education and Welfare to administer billions of dollars for programs of vocational education in its various forms, through activities in manpower administration, the Job Corps, and by means of work-study programs, it has been clearly evident that the student, teachers, and parents recognize the need to acquire not only a good background of general education subjects in the secondary school, *but also such preparation as may be needed to function efficiently in industry*. In this regard, such training is construed to include not only the necessary manipulative skills, but also the associated auxiliary knowledge, technical information and related instruction required of the youthful craftsman in his early employment and subsequent advancement.

The Challenge for Vocational Education

Vocational education is part of total education, with appropriate emphasis on those elements of the broad program of education that prepares individuals for the world of work. Other elements of education are also part of the overall needs of the individual enabling him to become a fully functioning citizen in an industrial and technical society.

The secondary school student will need to acquire not only manipulative skills, technical and associated knowledges, but also a broad background in the fields of English, social sciences, physical education, and health. He will also need to engage in other co-curricular activities as well. In the true meaning of vocational education, the graduate of the secondary school program should be prepared for an occupation and also equipped to discharge the duties of effective citizenship on local, state and national levels.

It is a responsibility of the secondary school to provide for (1) wide areas of vocational-technical education in response to student interests, and (2) a high degree of articulation and integration between the segments of vocational and general education. One statistic relating to the urgency of this responsibility is that in June of 1968, approximately three million high school students were graduated from secondary school programs of the nation and became available either for the general labor market or for higher education. To be employable, between 50 and 70 percent of the youth were required to have some competencies and skills. Throughout the publications of the U.S. Department of Labor, and other bulletins which emanate from the United States Office of Education, facts concerning youth skill requirements have been repeatedly emphasized. Yet, and to some extent because of factors beyond the control of the public school, other data provided by national agencies indicate that *only 15 to 18 percent of all young people who begin school in the first grade continue on to earn the baccalaureate degree.* This one fact places a real burden on the secondary school responsible for providing not only for those who pursue higher education but also for those who exit from formal education upon graduation (or before) from the secondary school to enter the labor market. It is clearly evident that public secondary schools (as well as the junior high schools and elementary schools) must supply the necessary guidance, occupational information, survey of occupations, and other means of introducing 85 percent of the students to the world of work.

It is apparent that secondary schools face responsibilities of a magnitude seldom experienced in their earlier periods. In 1965, Francis Keppel, then Commissioner of Education, estimated that in the succeeding ten years, seven million young people would enter the work force without benefit of high school graduation unless steps were taken to provide programs designed to meet their needs, interests and motivations. Meaningful education was his theme and he urged public educators to provide equal consideration to academic, general and vocational education on the secondary school level.

Apparently, the urgency still remains. In the Fall issue, 1967, of the Kiplinger publication *Changing Times*, the statement was made that "young people are pouring into the labor force at a record rate of 50,000 per week, and they are unprepared for the thousands of available good paying jobs." The article reviewed the annual shortage of nearly 500,000 skilled craftsmen, including carpenters, bricklayers, plumbers, electricians, machinists, and mechanics of all kinds. It stressed the fact that (1) most young people do not attend college, and (2) only one of ten individuals who graduate or leave the public secondary school system has any occupational preparation. Those who drop out of high school and do not later resume their education are not a special "below average" segment. Rather, they are fully representative of this age group in intelligence and productive potential. Thus, with the overwhelming proportion of secondary school students receiving only severely limited training for the world of work, and with the awareness that good paying occupational opportunities are available only to trained applicants, it is absolutely imperative for the public schools to accept the challenge . . . and move to meet it.

Effects of Federal Legislation

The Vocational Education Act of 1963 clearly prescribed the steps that had to be taken to provide more and better vocational education opportunities. The secondary school program, as part of all public schooling, was identified as a key area for subsequent development. It was made quite clear that the need to provide vocational education was not confined to specific age levels. A panel of educational consultants recommended measures, and Congress legislated them, on the basis of several basic principles. Two of these principles have special significance to administrators and supervisors with responsibilities for planning vocational-technical education facilities.

(1) Vocational education programs must be constantly adjusted to the needs and specifications of the labor market. Secondary school vocational-technical programs must consistantly reflect and accommodate national labor requirements and technological changes. Programs, as well as facilities and equipment necessary to service programs, must be readily adaptable to modification. Additions, deletions and changes in the curriculums which result in compensating changes in facilities and equipment are permanent characteristics of effective vocational-technical education. This factor is broadly described as "flexibility".

It encourages and provides for changes in the educational program due to evolving occupational information, advances in technical knowledge, and auxiliary knowledge, and new manipulative skills, all of which will be needed for employment. To effect such "flexibility" active cooperation is required among public employment agencies, school guidance counselors, other sources of occupational information and exploration, the schools, plus regional labor and management organization.

Illustration C.

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(2) Secondary schools must provide vocational education opportunities for a wide range of student capabilities and potentialities. Many students lacking the capability for higher levels of occupations must be provided with less demanding occupational training opportunities. Secondary school vocational education must include a full spectrum of opportunities if it is to effectively meet the needs of many levels of intelligence and aptitude. It must seriously consider the provision of training and education for those who are intellectually less able to acquire vocational training, as well as for those at the very highest level of ability. Between these two extremes lies the bulk of many occupations, requiring preparation ranging from short-term training to several years of mastering skills and acquiring technical knowledge. Since an increasing number of young people will be required to have a secondary school diploma for initial employment, the secondary school must provide academic education in conjunction with vocational-technical education for each student. This requirement may result in a dramatic departure from traditional education patterns in most public secondary schools. Also, it will continue to require increased emphasis upon innovation and creativity

in the design, planning and equipping of educational facilities.

Illustration D.

CHAPTER 2. GROUPS SERVED BY VOCATIONAL-TECHNICAL FACILITIES

Many groups and individuals, in-school and out-of-school, can be served by the vocational-technical facilities of a secondary school but they must be considered in the earliest planning stages of the project. Secondary school students, high school drop-outs, employed youth and adults, industrial apprentices and middle management groups are but a few categories of individuals who may (and will expect to) be served by any proposed vocational-technical facility.

In order to obtain maximum utilization of facilities, *it is essential that those to be served be carefully identified in relation to their specific needs*. One of the primary areas of concern is to provide important and essential instruction to prepare young secondary school youth for the world of work. This is an important group and these are the young people who presumably have had some guidance and exploration through programs of introduction to vocations, industrial arts and homemaking. They should have acquired some background of occupational information to provide them with the basis for making valid vocational choices.

Some educators, however, maintain that secondary school youth, by virtue of their age, have little basis on which to make valid occupational choices. urge that the vocational-technical phases of education be delayed until the post-secondary years. This may be an unrealistic point of view, since students in vocational-technical programs have in the past (and probably will in the foreseeable future) come from the lower socio-economic strata of the population. As such, they are often required by family commitments to leave school and enter the world of work at the earliest possible age, generally around 16 or 17. If such individuals are to receive occupational preparation, secondary school vocational-technical education must be provided. To ignore their needs would permit large numbers of youth to enter the world of work without saleable skills and grossly deficient in technical knowledge commensurate with the needs of the society.

Illustration E.

Where vocational-technical education cannot be provided by the regular secondary school program, such educational needs will exist after the youth have gone out and discovered that entering, remaining and advancing in an occupation can be severely limited by a lack of such skills and technical knowledge. Ultimately, facilities must be designed to provide vocational-technical education for this late afternoon and early evening group of part-time students who have been exposed to the realities of work.

Adults, as another group, represent a major element to be considered in planning facilities. A few states conduct most adult instruction in junior colleges, technical institutes and comprehensive community colleges. However, established adult education practices in many areas place the responsibility on the secondary school to make its facilities available to adults throughout the day and evening.

The adult group consists of those who, by virtue of technological advances, find it necessary to obtain updated instruction. Thus an individual who observes many of his fellow craftsmen and operators being replaced by automated equipment will seek instruction in the nearest institution that will enable him to hold and progress in his job. For example, the need to update skills is increasingly important in the machine tool industry.

With other adults who are "under-employed", the process of upgrading will require extensive use of educational facilities. Among the under-employed are individuals who, by virtue of the need to enter the labor market at an early age, have not been able to fully develop their employment potential. As a result, they are employed at occupations which challenge neither their intelligence nor their aptitudes. Adults such as these often return to the vocational-technical school to increase their compentance and ability for higher level employment.

Other adult groups, drawn largely from the fields of apprenticeship and supervisory development training, may make rather extensive use of secondary vocational-technical facilities. In several parts of the nation, the apprenticeship programs are well developed. Regularly apprenticed individuals are routed to the nearest vocational-technical school to obtain instruction related to job-learned manipulative skills. Indentured apprentices, as well as factory apprentices, take advantage of this educational opportunity to move rapidly toward journeyman status. As a general rule, apprentices attend the late afternoon and evening classes for periods of approximately four hours per week. Since their prime purpose in attending is acquisition of technical knowledge, and on occasion some additional manipulative skills, their use of the shop facilities is quite limited. Classrooms and small meeting rooms for groups of approximately 15 or 20 apprentices are sufficient, and the same facilities may be used by different apprentice groups throughout the week.

Illustration F.

Another adult group is comprised of industrial foremen, plant superintendents, manufacturing supervisors and other similarly employed individuals. Many require help in job instruction training, job methods training, job relations training, and in principles of supervision. Often, these are individuals who have been selected from journeyman and craftsman ranks for supervisory positions. As may be expected, they lack many supervisory skills. Supervisory development training for this special adult group is often provided by the vocational-technical school in cooperation with an industry where the middle management group, foremen, and others of similar classifications are employed. Such instruction does not always occur in the secondary facility. On occasion, it is provided on company time in company facilities. However, where supervisory development training for this special group of employed adults occurs within the secondary school, early planning of the total facility must include necessary accommodations such training.

Illustration G.

By virtue of the great diversity of groups to be served by the vocational-technical facility, it is imperative that the planners keep in mind the need to provide facilities and equipment which may be adapted with minimum effort and expense to frequently changing educational needs. While planners do not usually anticipate extensive use of the facility beyond the regular day school, it is widely known that *adults served by vocational-technical facilities often* *number 3 to 4 times those served as full-time day students.* Thus, the need to anticipate rapid change and plan for immediate modification is of great importance. Moreover, it will become even more imperative if, in addition to the previously considered groups, opportunities for occupational education are to be provided for the service occupations and manpower areas. These include many of the short-term (up to one year) training programs associated with the Manpower Development and Training Act, and such public service training areas as truck driver training, custodial training, fireman training, police officer training, and others.

Illustration H.

CHAPTER 3. PATTERNS OF VOCATIONAL-TECHNICAL EDUCATION

Introduction

Secondary level vocational-technical education is currently being conducted in a wide variety of facilities. Much discussion, and some argument, has ensued concerning the "best" type of facility for such a program of education. The following sections will attempt to describe briefly various current approaches primarily to demonstrate the variety and flexibility of potential solutions.

Comprehensive High School

The concept of "comprehensiveness" in the education of a young person being prepared for the world of work has been defended and given considerable emphasis in many secondary schools. The *comprehensive high school* claims to have the potential to provide more young people with a fuller understanding of the world of work, in association with pre-vocational exploratory opportunities related to a wide variety of vocational possibilities. Thus, the objectives of general education and the vocational education of the secondary school may be achieved. Furthermore, it is believed that comprehensively educated students will understand the concepts of general education far better when they see them applied to occupational education. The task of providing both general education and vocational education for millions of young people is obviously enormous and numerous school organization patterns have been suggested to achieve it.

Area Vocational School

In many states, other educators feel that the long and successful history of vocational education has shown the separate or *area vocational school* to be the "best" possible means to meet the challenge of the future.

Where vocational-technical education is conducted in "separate" or area institutions, a complete secondary school program leading to a diploma is offered along with an organized program of skills and technical knowledge required of individuals who will enter industry upon graduation. General education requirements include English and social studies which, when added to the applied mathematics and science, provide each student with a full, secondary school program. Some students, upon completion of such a program, are immediately employed and continue their education on a "learn-while-you-earn" basis. Graduate follow-up studies show them enrolled in evening technical institutes, community colleges, and in senior college programs directly after entering employment.

Cooperative Training

A third approach represents a more comprehensive approach by providing vocational-technical education on a *cooperative training* basis. No equipment is required in this approach, for students accepted into the industrial cooperative training program acquire their occupational skills and much of the associated theory directly on the job.

Coordinators of such programs must be highly skilled teachers with considerable work experience. They have the responsibility of placing students in suitable local work-study employment thus enabling them to acquire specific skills and technical knowledge on a daily work-study basis. Students receive hourly pay for their part-time work. Their remaining time in school is devoted to acquiring applied subjects and general education. The average student-coordinator ration is 25 to 1. The only space requirement in the school is a reasonably large classroom for the supervised study of applied or related subjects. Work tables, storage facilities and provisions for projected visuals constitute the basic classroom requirements.

For years, many states have successfully conducted their vocational-technical education programs as industrial cooperative training programs within comprehensive high schools.

Regional Service Center

The *service center*, often called the "skill center", is a facility which, as the result of cooperation between several towns, several cities or even several counties, has become the focal point for all vocational-technical education. It is jointly used and supported by all of the participating educational agencies. Thus, where a comprehensive high school would tend to require somewhat in excess of three thousand full-time day students in order to provide a reasonable selection of occupational programs for both male and female students, the service center, serving a group of participating smaller school may concentrate the expensive equipment under a share-cost plan serving a much larger enrollment.

Illustration I.

Situated so as to serve the cooperating high schools, groups of students enrolled in vocational-technical training programs are bussed to the service center for a full morning of vocational instruction. The students are returned to their respective schools by noon. A second group of students replaces them at the service center in the afternoon. Joint responsibility for the selection of site, facility design and construction, selection and purchase of equipment, and ongoing annual recurrent expenses are shared proportionally by the participating schools.

The regional service center has found much favor in the secondary school organizational pattern since relatively few secondary schools in the nation currently achieve enrollments of three thousand or more full-time students. Relatively small schools find that they must limit vocational education opportunities if they are to stay within the limits of the typical annual operating budget.

Separate Structure

Still another type of structure which tends to bridge the gap between the "philosophically" oriented comprehensive high school and the "practically" oriented separate vocational school is the *separate structure* or building. In this plan, a building is placed on the same campus with other secondary school facilities, but it maintains its specific purpose and identity for the students while remaining an integrated part of the overall planning and operation of a comprehensive high school complex.

Combination Secondary-Post Secondary Institution

An effective arrangement which has made an impact on educational facility planners in this field is the structure which provides occupational preparation for grades 10 or 11 through 14. This concept represents the philosophy of vocational education as a single area of emphasis, unfettered by artificial grade-level distinctions and considerations.

According to the Vocational-Technical Report for fiscal 1966 of the U. S. O. E., 186 of these new institutions type have been constructed, and many new one will soon be under construction; recent projects are in Quincy, Massachusetts, Boulder, Colorado, and Milan, Ohio. Since others are being planned, educational facility planners should give very careful consideration to this kind of facility as a potential solution to the problem of providing adequate vocational-technical education for a specific population area. Very obvious capital savings may be realized by multiple and/or continuous use of expensive equipment in shops and laboratories under a single administrative/supervisory staff. Other advantages, which on a cost-benefit basis may take several years of operation to substantiate, include benefits occurring to a region's economy by making more attractive to adults post-secondary educational opportunities to update and upgrade their skills and increase their technical knowledge.

COMPARISON CHART

Area Vocational Schools (Secondary Level)

Vocational High School	*Usually grade 9 or 10 through 12.*
	Offers full program of skills, related instruction and general education.
	Students attend full-time.
	Students graduate and obtain secondary school diploma.
	Usually located in a well populated area or city.
Skill or Service Center	*Usually serves a region or an area.*
	Student bussing is required.
	Students maintain membership at their home schools.
	Students come from many schools within larger area.
	Students receive diploma from home school.
	Two complete groups served on half-day basis.
	Related instruction is usually offered at the home school, although it can be offered at the skill center.

Area Vocationl Programs (Secondary Level)

Comprehensive High School	*Students are regular secondary school enrollees.*
	Instruction of a vocational nature is usually provided in grades 10 through 12, 11 and 12, or even 9 through 12.
	Students graduate with secondary school diploma.
	Related subject instruction is either provided by the shop instructors or by specially designated instructors.
	Students receive specialized vocational instruction plus the broad general education program given other students.

Programs of instruction that are conducted in area vocational schools are usually classified as "area vocational education programs". In addition, however, area vocational programs for the secondary schools include those that are offered in the comprehensive high schools, providing they meet the conditions and definitions used by the U. S. Office of Education for purposes of federal reimbursement. In general, an area vocational education program must include no less than five occupational offerings, each drawn from a different broad cluster of offerings.

Summary

As secondary school planners attempt to provide for the future, it should be apparent that there is no "best" procedure for providing secondary school age youth with the skills, technical knowledge and general education to finding their most productive niches in the burgeoning national economy.

Secondary schools, whether comprehensive high schools or separate vocational schools, must be concerned with no less than all of the non-college bound students. Vocational education opportunities must be provided for the average student, the exceptionally bright student, and for the educationally handicapped student. Thus, separate vocational high schools, comprehensive high school programs, separate area vocational service centers, or other organizational patterns should be thoroughly considered when planning vocational-technical education programs.

Illustration J.

CHAPTER 4. FACILITY PLANNING CONSIDERATIONS

Initial determinations related to needed facilities should be based on the results of a comprehensive, area-wide study which reveals (1) the kinds of occupations needed in the area, and, of greater importance, (2) the interests and inclinations of students to prepare for certain kinds of occupations. Such a study is the focal point around which the program of vocational offerings must be built.

If facility planners accept the indicated needs of students as a factor of prime importance, and the needs of the employers in the region as a factor of secondary importance, facility planning will follow one particular philosophy. However, where the needs of employers for specifically trained employees takes precedence over other factors, the planning may ultimately produce facilities quite different from those based on the preceding basis.

In any case, a survey of the numbers of students as potential enrollees is an important consideration. Samples of suggested student and employer survey forms are provided in the appendix section of this publication.

The survey should reflect pertinent regional demographic factors and appropriately weighed socio-economic aspects of vocational-technical education for the survey area. The survey should identify:

(1) Characteristics of youth and adults to be served,

(2) Existing regional employment opportunities,

(3) Interests of young people regarding vocational education possibilities, and

(4) Curriculums necessary to provide the widest range of opportunities for the largest number of students.

From employers in the region, efforts should be made during the survey to determine the extent of training and education currently needed, and projected needs for the next decade. Particular attention should be given the primary and secondary sources of information for all programs. For example, if specific occupational information comes from but one level of administration, undue emphasis may be placed on areas of study inappropriate and ill-suited to the general needs of the area. Personnel directors or employment managers may emphasize "a broad, general education". On the other hand, formen, master mechanics or manufacturing superintendents may emphasize skills associated with mathematics, blueprint reading, the sciences, mechanical drawing and design. Any projected survey should sample broad sources of information as a preface to decision making. The sample survey forms (see Appendix) are suggested as guides to the categories of essential planning; however, they should be carefully modified to reflect regional differences.

Site Selection

The selection of an appropriate site for a vocational-technical education facility must initially reflect concern for existing secondary school facilities. If, for example, the area program consists of five or more occupations to be added to an existing secondary school program, an addition to the existing facility will probably be all that is necessary. Thus constructed, the essentials of the comprehensive high school program may be approached. Care should be taken, however, not to detach or "set apart" vocational facilities from all other educational facilities. To do so may very well serve to perpetuate the separateness - the dichotomy which has too long plagued academic and vocational education.

If separate facilities are to be constructed, a site of sufficient size must be selected to provide for initial construction plus anticipated expansion. A simple rule-of-thumb guide for such a minimum site is: *10 acres plus 1 acre for each 100 students.*

This rule must be flexible, however, since real estate costs greatly affect the final acreage. For example:

(1) If the adult evening program is to be extensive, with 3 to 4 times as many evening students as day students, the parking acreage must be large enough to accommodate the larger evening enrollment based on approximately 140 cars per acre.

(2) If the day school population continues to be drawn from the lower socio-

economic stratas, the school should be located near the student population to minimize travel expense. In such a situation, it may be impossible to acquire adequate acreage and move to high-rise facilities may be imperative. Such facilities might then be designed on a minimum site of two to three acres with three to five below-grade parking levels.

(3) Other considerations, which help to determine site locations and size, include (a) availability of electric service, (b) sewage disposal, (c) water and gas, (d) highway system, and (e) public transportation. For example, many vocational-technical curriculums require heavy electric service, and the cost of bringing this power to remote site can be quite expensive.

(4) Another factor in site selection often overlooked is that of "visibility". Vocational-technical facilities often need to be seen by the populace served. Youth and adults need to know of available opportunities, Vocational education and its program of public information, may be greatly enhanced by locating the institution at an obvious focal point. Remote and hidden locations are not recommended where planners give high priority to the "visibility" factor.

Community Attitude

Another important factor to be considered concerns the philosophy of vocational education permeating the region. An attitude of provincialism would restrict the curriculum offerings in a given region and make it impossible to provide for most of the reported interests of secondary school youth, especially if immediate job opportunities in the area were very limited. Conversely, an attitude of concern for the interests of young people, with the possibility that employment would be on a much broader geographic basis, would result in much different vocational-technical facilities.

Sensing this attitude is a major responsibility of the interpreter of the survey instrument. Inasmuch as subsequent decisions affecting regional planning will reflect community attitudes, it is necessary to conduct samplings representative of the citizenry to obtain information that:
(1) reveals the limits of citizen concern about the preparation of secondary school students for entrance into the labor market, and
(2) indicates taxpayer reactions to the possibility, indeed the probability, that graduates may migrate to other areas for employment.

Such considerations have considerable significance to taxpayers since the investment in facilities, staff and programs may be considerable without observable dollar returns.

In the area of community influence alone - that of "provincialism" versus "training for employment on a broad geographic basis" - the interpreters of survey data may face difficult and perplexing decisions. Unwise decisions may result in facilities which are either inadequate to meet the needs or too large to win taxpayer approval. With the full knowledge of work force mobility, and the fact that a readily available skilled work force attracts new and expanded industry to the area, there is some advantage to considering both points of view before planning a program of vocational-technical education that is a blend of both.

Types and Levels of Curriculums

Planning vocational-technical education facilities also requires careful consideration of the following broad questions:

(1) For whom are the curriculums organized
(2) What kinds of qualified teachers will be required
(3) Of what elements will the curriculums consist

Emphasis should be placed on curriculum and those who will be involved in the teaching-learning process, with the implications that subsequent facility planning will be related to specific curriculums. Expressed in another way, "the building should serve the program". The facility should not be planned until the groups to be served and the curriculums to be provided are finalized. There is little wisdom in approximating the square footage, student capacity and equipment budget until these basic questions have been answered.

Illustration K.

Judgments must be made early to identify (1) students primarily suited to "operator" type jobs, (2) those qualified for "craftsman" training, and (3) those with aptitudes suggestive of successful employment as "industrial technicians". These three broad levels of employment, and the several intermediate levels, must be understood by facility planners. They must know the employment opportunities associated with each in order that the curriculums offered and facilities provided are specifically designed for each group. Obviously, curriculum decisions have design, space, and equipment implications for shops, laboratories and classrooms.

Occupational Analysis

With the results of area surveys, and with some preliminary decisions about occupations and their levels of preparation, it is now essential to secure occupational analyses. Many valid analyses have already been produced for most standard trade, technical and industrial areas of employment. These are available from such agencies as state labor departments, divisions of employment security and state divisions of vocational education. Complete occupational analyses show the extent and detail of needed manipulative skills and also indicate in detail the amounts of technical knowledge, auxiliary information and theory to be taught concurrent with these skills. If they have been expertly produced, they will include the emphasis placed on related shop mathematics, related shop sciences, mechanical drawing, free-hand sketching, blueprint reading, layout and design.

Communication skills, such as written English, technical report writing, spoken English, economics and other elements of the so-called "general educational" phase of the curriculum, must be carefully identified and weighed. Out of such considerations will come the ultimate determinations as to staff, faculty, number of laboratories, classrooms, and equipment.

Where occupational analyses are available from agencies, much time may be saved. There is the possibility, however, that analyses produced in one region may not be transferable to another. They may be seriously out-of-date because of rapidly changing manufacturing and technological advancements. The use of a craft, advisory or consulting committee, drawn largely from employers in the area, could be exceedingly valuable. Such a committee would update the occupational analyses and reflect modern industrial practices. Planning efforts should provide for "currency" of curriculum and equipment by obtaining from qualified personnel information on new processes, new products, and on new materials anticipated in the immediate future. This information should provide the required "lead time" so vitally necessary in the early planning stages. Often, as many as five years elapse between the original planning and graduation of the first group of students. Therefore, efforts should be made to probe deeply into the knowledge and information held by the members of the craft, advisory and consulting committees so that vocational-technical education may be planned that will be current when students graduate into the labor force. Detailed information about many respective occupations should be examined and, as much as possible, "clustered" to prepare students for broad categories of employment. With the Dictionary of Occupational Titles (DOT) describing many thousands of occupations, it is clearly evident that vocational-technical education cannot possible provide instruction for each specific occupation.

Illustration L.

The procedure of "clustering" tends to group, within a single shop facility, those closely related occupational areas of a vocational-technical program. Students training for occupations such as machine operator, machinist, toolmaker, diemaker, diesinker and automatic screw machine operator would receive their education in a single large shop or cluster facility. Clustering has the additional advantages of (1) course organization around common core areas of study, (2) transfer within the cluster from one job objective to another without undue loss of time, and (3) more rapid adjustment in the labor field from one job in a cluster to another. This last item is both valuable and necessary in a rapidly changing technological society where occupations disappear annually and are almost immediately replaced by others which are either new or resemble occupations which have disappeared.

Clustering of occupations makes it possible for a graduate who has acquired basic skills, technical knowledge and communication skills to make a rapid transfer or transition among clustered occupations when changes occur. Craft advisory and consulting committees may be extremely helpful in designating occupational clustering. From this assistance may come the designation of a feasible study area worthy of consideration by the secondary school administrator.

Insert approximately this postition a fold-out chart giving the same planning stages in chronological sequence as in the text. It is imperative that identical information appear both on the chart and in the text.

Planning Chronoloby

The following is a chronological sequence of suggested steps to be taken in planning for a secondary level vocational-technical education facility. This applies to both day, and late afternoon and/or evening student programming.

1. DETERMINE THE EXTENT OF AREA INTEREST

The planning group should sample the extent of extent of interest on the part of industry, lay groups, area leaders and others. This is not a depth study but merely an initial survey to determine the initial interests being expressed anywhere (or everywhere) in the area of potential service.

2. ASSEMBLE A CONSULTING OR ADVISORY COMMITTEE

This group of 8 to 12 individuals from the region should include people from management, labor, the mass media, trade or craft groups, citizen groups, taxpayer associations, employment security agencies, education, business, and other regional interests. No attempt should be made to equalize influences on the committee. Rather, the best intelligence in the region should be sought and invited to serve.

3. EMPLOY A SURVEY DIRECTOR AND CONDUCT A SURVEY

The survey should reveal:

(a) Interests of young people in vocational-technical education.

(b) Needs of adults in the same region for up-dating and up-grading instruction.

(c) Jobs currently available in the region, by category and number.

(d) Job projections over the next 5 to 10 years.

(e) Appropriate sites for the school, if provided.

(f) Other public and/or private educational agencies in the region that are offering (or plan to offer) similar vocational-technical education.

(g) Curriculums of highest interest to pre-secondary school students.

(h) Number of students indicating interest in specific curriculums.

(i) Clusters of curriculums which might indicate the need for programs in: metal trades, graphic arts, construction trades, etc.

(j) The dollar differential that will be paid by regional employers for trained high school graduates versus untrained graduates and others.

4. PRESUMING THE NECESSITY, EMPLOY AN ADMINISTRATOR

This person should be work-oriented, and one who satisfies all of the requirements for local director of vocational-technical education as detailed in the State Plan for Vocational Education. This plan is available in each state at the Office of the State Director of Vocational Education.

5. SUB-DIVIDE THE CONSULTING COMMITTEE

The responsibilities of committees are many, but generally they fall into three classifications:

(a) Site

(b) Program

(c) Facilities and Equipment

Additional personnel and consultants may be added to the consulting committee at this point, as ex-officio or temporary personnel. The responsibilities of the sub-committees are outlined below.

The site sub-committee may wish to augment itself with local or regional realtors that would know the locations and values of available sites. Also, the site sub-committee would have to be concerned with the least number of student-travel miles as a firm justification for a site.

The program sub-committee would be concerned with the actual programs of instruction in shop skills, theory, related shop mathematics and science, drawing, general education, etc. For this responsibility, several different kinds of curriculum consultants may be needed to augment the membership of the sub-committee.

The facilities and equipment sub-committee will need to draw upon the advice of many practitioners in the industrial field for advice related to square-footage needed, types of equipment and tools required, etc. Facilities and equipment required must reflect the curricular content. Hence, this sub-committee must await the decisions of the sub-committee on programs.

6. EMPLOY AN ARCHITECT

The architect should have available to him all of the data and thinking developed by the consulting committee. His responsibility at this point is to produce preliminary layouts which show provisions for proposed programs of instruction.

7. IDENTIFY, ANALYZE AND OPTION THE SITE

The planning committee, working with the architect, should determine the availability of transportation to the site, water, sewage, power, telephone, etc. If satisfactory, test-borings at the site should be arranged by the architect. If satisfactory, the site should be purchased.

8. REVIEW THE PRELIMINARY LAYOUTS

The consulting committee, working with the administrator, has the responsibility at this point to analyze each part of the layout and to suggest to the architect such modifications considered necessary.

9. HAVE THE ARCHITECT PREPARE BASIC DRAWINGS.

These drawings should be reviewed in detail (1) with regard to the instructional program and (2) with regard to the eventual cost of the entire project. At this point, the available resources for purchase of site, construction, equipment and the conduct of the educational program must receive detailed study.

10. HAVE THE ARCHITECT PREPARE FINAL PLANS

These should be given a final review and, presuming that resources for construction and operation are available, made ready for bidding by contractors.

11. ADVERTISE FINAL PLANS FOR BID

12. OPEN BIDS AND AWARD CONTRACT

This presumes that the contract price submitted by the lowest bidder is within the prescribed budget. Otherwise, the archtiect working with the consulting committee must make modifications in the final plans and, in some cases, re-advertise for bids.

13. EMPLOY A STUDENT PERSONNEL DIRECTOR

His task will be to begin negotiations with the schools from which the vocational-technical students will come. He should provide information, test students, determine which students may be accepted, counsel, etc.

14. PURCHASE EQUIPMENT AND TOOLS

Depending on such factors as labor, construction complications, the section of the country, and weather conditions, construction of the building may require from 12 to 20 months. It may be longer if the building or buildings are *unusually large or complex. Equipment must be ordered sufficiently in advance to be ready for installation when the architect indicates the facility is ready to receive it.*

15. CONDUCT A FULL PROGRAM OF PUBLIC INFORMATION

Throughout the entire preparatory activity, a constant effort should be made to keep the community advised of problems, decisions and progress. This is particularly important, especially if the adult programs are to receive the appropriate emphasis and support which they deserve.

Potential Economies

Several avenues are open to the school planner to affect economies in building and equipping a school which maximumly extend the purchasing power of every available dollar.

For example, the site for the facility will have immediately evident characteristics, including transportation, availability, topography, surface drainage, ground cover, electric service, sewage, water and other utilities. However, the sub-surface site conditions are other factors that must be explored before the actual selection is made. Careful test borings are essential to be certain a sub-surface ledge or a concentration of rock or concealed fill does not make the use of the site exceedingly expensive. The relative economy in conducting an adequate pattern of test borings of the entire surface of the site cannot be over emphasized. In other words, educator/planners should not be guilty of being "penny wise - pound foolish". Planners should seek the best possible advice from realtors, architects, and the site selection committees.

Change orders made after construction has started often represent dollars spent that produce no additional educational advantages. Curriculums, planned and considerably detailed, need to be analyzed before the building undergoes initial design study and development. Every possible effort should be made to obtain "lead time" information so that unnecessary curriculums will not be offered while other valid curriculums are overlooked. Effective use of advisory committees is essential, and advice should be sought by planners from manufacturers, business personnel, hospitals, and other major areas of employment.

Arrangement of buildings on a site may also provide some economies. Reliance upon professional architectural advice is essential to obtain the most suitable structure for the specific site. In sections of the country where heating is required, compactness of a building and the possibility of central heating facilities should receive careful consideration. In other sections of the country, where heating is not of major consideration, the "campus" or widely dispersed building arrangement may be just as economical, aesthethically pleasing and more efficient.

In densely populated areas, where land is at a premium, high-rise facilities are almost mandatory. In less densely populated areas, land costs and construction economies must be carefully weighed in the light of program needs.

Illustration M.

CHAPTER 5. FACTORS AFFECTING DESIGN AND USEFULLNESS

Adaptability

It was pointed out earlier that in planning programs, two important concepts need to be considered: (1) the types of occupations for which training should be provided, and (2) the instructional levels that should be provided to meet the occasional training needs of the greatest number of individuals.

With the breadth of the vocational-technical offerings determined, the next step in planning must be the ease with which the facilities adapt to one, several or all of the proposed occupational types and/or levels of instruction. This is further complicated by the need to "cluster" the appropriate occupations, utilizing common facilities for the teaching of similar skills.

Vocational-technical education facilities must be so adaptable that as occupational changes offer, compensating changes may be made with minimum expenditure within the curriculums and in shop and laboratory facilities and equipment.

Adaptability must also be concerned with the urgent need for multiple and even "around-the-clock" use of facilities. There are youth who need instruction of a special nature in the hours between the closing of day school in the early afternoon and the opening of the evening school for the adult and extension activities. Also, as suggested earlier, training needs of the adult working population should be estimated early, since the adult enrollment often is three to four times the day school enrollment. The needs of these employed individuals often extend into more highly technical and manipulative areas of instruction. Adaptable arrangements for both space and equipment in the shops, laboratories and related science laboratories for adult "up-grading" instruction will mark the program as one which provides training opportunities for both area-wide youth and adults.

If easy adaptability of the facilities is to be one of the planner's considerations, it should receive early discussion with the architect. His advice concerning the use of non load-bearing walls, overhead electrical power bus ducts, and other similar characteristics will result in a facility capable of accommodating occuptational shifts and changes in the shortest possible time.

Another factor to be considered is that the square footage for any given shop or laboratory must accommodate the largest group to be served by the facility. No rule-of-thumb concerning square feet per student is advanced here since occupational offerings require different amounts of work area per student. For example, the number of square feet needed per student in gas welding is considerably less than the the work space needed for each student in the automotive trade shop.

The architect's advice must be coupled with the factors of intended use of the facility: (1) the instructional needs (which may involve equipment determinations) of the different groups, (2) the respective numbers in the groups that could be effectively instructed at any given time, (3) instructional methodologies to be used, and (4) the materials, supplies and equipment appropriate to the program.

Instructional Levels

A great difference exists between a shop or laboratory designed to provide the simplest essentials of craft training and those facilities which provide in-depth trade training. Depending on whether the shop instruction will be offered during the eleventh and twelfth years of a secondary school program or during the tenth, eleventh and twelfth grades, it is evident that the quality and quantity of equipment will be affected. Design of the shops and associated laboratories cannot be effectively undertaken until the levels of instruction have been clearly identified. The extent to which technical subjects and general education will be proportioned in the overall curriculum also will be a factor for consideration.

General Education Component

The extent and concentration of subjects within the high school program, as well as the extent to which related shop mathematics, shop science, mechanical drawing, lay-out and design, free-hand sketching and blueprint reading, and other similar topics are offered, must be considered by program planners. Facilities, therefore, must reflect the emphasis given to these areas.

For example, if the general education program is kept to a bare minimum and merely meets the lowest possible level of communication skills needed for graduation, then institutional classroom needs will be much less than those of facility offering a full complement of general eduation instruction along with shop and laboratory instruction.

Course Chronology

The chronological order of curriculum subject areas may affect the provision of facilities within the institution. For example, if physics is offered during the sophomore year and chemistry during the junior year, it may well be that sheer numbers will require providing multiple physics laboratories. The same situation would prevail for chemistry or other subjects. On the other hand, where physics is offered for some of the curriculums during the sophomore year and for other curriculums during the junior or senior year, less physics laboratory space and fewer chemistry laboratories will be needed. In some instances, where two physics and one chemistry laboratories are desirable because of the organizational pattern, careful reorganization of the chronological pattern may reduce the requirement to a single physics and a single chemistry laboratory.

This in itself will result in considerable savings without affecting the quality of the instructional program. In fact, as a side benefit, it may result in more efficient laboratory utilization throughout the school day. Although about 80 percent school day utilization is considered feasible for a school laboratory, careful chronological scheduling of groups into the facility may produce a level of efficiency surpassing that target.

Instructional Methodology

Should an early decision determine that individualized instruction is to be the major approach to the teaching-learning situation, equipment selected and purchased should reflect that decision. Individualized instruction, and its underlying philosophy, may be found in many publications in the field. Since the early days of vocational education it has been considered "mandatory" that each student be maximally assisted and encouraged to achieve the highest level of competence in terms of his individual aptitudes and capabilities. Today, in many schools throughout the nation, individualized instruction has increased in most study areas through automated teaching devices, decreased teacher-student ratios and other procedures. Facility planners should anticipate the use of such methodology, equipment and facilities to capitalize on the potentials of individualized instruction.

At the same time, facility planners should consider the value of small group instruction from time to time or, on occasion, large group instruction. Some relatively small theory rooms may have to be provided for each of the shops and laboratories where small groups of six to ten students gather for technical discussions. Also, tiered lecture rooms should be considered for the assembly of multi-class groups. These rooms seat approximately seventy students, yet the floor space requirements approximate those of a typical 30 student classroom.

Illustration N.

Because of rapid advancements in new and important multi-media instruction, such as closed curcuit television, automated devices, computer managed and computer assisted instruction, some attention must be given to the space in which students work and study. Space for both small and large group closed curcuit television viewing is an example. Such viewing is often confined to the room in which the demonstration occurs. Used this way, the procedure is known as "electronic magnification" since it provides comprehensiveness and viewing not ordinarily achieved by the instructor's usual front-of-the-classroom demonstration.

Practice Exercises Versus Customer Work

Another important aspect of facility design is the consideration of where to conduct skill type instruction. In many established secondary schools, the practice has been to establish and equip complete shops and laboratories to meet the needs of both day and evening instruction. In other parts of the country, notably the south and the southwest, emphasis has been on cooperative trade and industrial instruction. In this approach, the skill aspect of instruction is conducted in actual industrial establishments while the classroom instruction is conducted in the school. Field training on customer-owned equipment after basic preparation has been provided is a technique used by many vocational-technical schools.

When skill instruction is planned for the secondary school shop, another factor should be considered. This involves the use of in-school facilities for skill training making use of "customer or outside work" as a major device for developing skills and associated technical knowledge.

To cite an example, students of carpentry are taught specific skills on scaled down projects, small models, or by building a miniature house on a concrete slab provided on the school grounds. Space requirements for this type of skill teaching will differ considerably from those situations where the skills are taught largely on "customer" provided job sites. In the latter, students are transported by school vehicle to the customer site where a house is actually being constructed. In this way, skills and the associated technical knowledge are provided away from the school, yet are under full supervision and control of a qualified instructor employed by the school. Use of customer sites result in a considerably lowered space requirement for the instructional facility.

Other occupational training programs could be similarly affected but in varying degreees. For example, a cooperative program would make very little difference in space requirements for mechanical drafting, architectural drafting, sheet-metal shops and a few other shops. However such outside training for occupations such as electrical construction wiring, plumbing, bricklaying and masonry would result in a considerably lowered square-foot requirement for school shop space.

The Selection of Equipment

Because facilities must be planned to give consideration to multiple and even "around-the-clock" use, equipment must meet not only the needs of the day school students but also the needs of employed adult students.

Because of the different groups served, equipment provided in technical laboratories and shops should be of the type normally utilized in the industries which will ultimately employ the graduates. Acquaintance with current industrial equipment is essential and careful consideration should be given to providing equipment that will best do the job in employment-oriented types of instruction. To restate, the type of equipment used to prepare young people for employment may greatly affect the ultimate placement of graduates. Employers, many of whom hold membership in craft and advisory committees, will examine the kinds and quality of equipment used in the training programs and will form conclusions concerning the validity and efficiency of the training program. Planners of the proposed structure should carefully consider the advice of many and varied sources. Once equipment decisions are made, further progress relating to shop and laboratory space requirements can be made.

Equipment Quality

Industrial advisory committees have always been extremely useful in helping planners make the right decision about equipment offered by local or area industry. Planners should carefully consider equipment requirements for the vocational-technical facility and arrive at basic decisions before going too far and too rapidly into the matter of space. Laboratory and shop equipment for a vocational-technical program represents a considerable expenditure. In large installations, it may be as much as one-third the total cost of the facility.

For example, the most expensive shop to equip is a machine shop. The expenditure for machine tools needed to conduct a broad program of training may easily amount to $200,000, especially if new and high quality equipment is purchased. Some savings may result through the purchase of reconditioned equipment, much of which may serve the training purposes very well. Other occupational training shops where equipment costs tend to be quite high include automatic screw machine, automotive and diesel, and industrial electronics. By comparison, equipment for carpentry shops, mechanical drafting and plumbing would require a much more modest expenditure. In general, however, where facilities are to provide a wide selection of occupational offerings, the "one-third of total cost" is a reasonable rule-of-thumb.

High quality equipment frequently is more economical than many of the substitutes. The cost and time of maintenance to keep substitute equipment in good working order, plus the factor of obsolescence, is a major consideration. Much of today's manuafacturing efficiency depends on high speed, precision equipment capable of demonstrating fundamental operations under actual industrial manufacturing conditions. These factors should be of primary concern to the facility planners. Planners would do well to avoid inferior equipment.

The cost of shop and laboratory equipment often is so high that it is impossible to provide multiple units of the same model. This condition directly affects the instructional methods which will, in turn, affect building specifications. For example, instead of having four or five small and inexpensive lathes in a maching shop, it might be advisable to purchase a single lathe with all of the modern intricate controls, along with supplemental devices and items of auxiliary equipment. Such a piece of equipment might cost more than the half-dozen inexpensive substitute lathes yet provide a quality of instruction impossible to achieve with anything less. The use of one modern production model precision machine may very well require more dependence on individualized instruction than on group or class type instruction in that shop.

Methods of Effecting Equipment Savings

(1) Surplus Properties Considering that the initial cost of new equipment of commercial size and type may be considerable, other sources for obtaining equipment should be explored. One such source of valuable equipment for schools is the Surplus Properties Administration of the United States government. Through "surplus", schools have been able to purchase, at relatively low cost, excellent items of equipment which adequately serve instructional needs. However, great care should be exercised in the selection

of such surplus properties. A piece of equipment should not be purchased and placed in a vocational-technical facility chiefly because it is inexpensive or a "good buy". Educational values are related directly to the quality of equipment, and equipment should be able to provide the student appropriate speed and accuracy in the acquisition of skills. This will be even more critical if employed-student use is made of the equipment. Employed apprentices and workers will expect equipment to be sufficiently accurate and "fast" if they are to acquire additional skills and technical competence.

(2) The National Industrial Equipment Reserve Another valuable source of equipment is the National Industrial Equipment Reserve (N.I.E.R.). As a responsibility of the Department of Defense, machine tool depots have been established in a number of places in the United States and are used to store metal-working and production equipment needed for a war effort, is becoming necessary. Since the stockpiled equipment must be kept up-to-date, as a mandate of the law that created N.I.E.R., there is a constant effort to release training equipment to public educational facilities. Thus, applications made by vocational-technical schools and programs to the National Industrial Equipment Reserve may result in quantities of machine tools and other types of metal-working equipment needed to equip an area vocational school facility or for a metal working laboratory in a comprehensive high school. These items cannot be purchased since ownership must be retained by the U. S. Department of Defense. The only costs involved in procuring the equipment for public schools are those of transportation and insurance for the equipment while in transit between depot and the training institution.

A number of restrictions have been placed on the use of the equipment but these restrictions generally are observed by public educational agencies as a matter of course. Such restrictions are: (1) no charge may be made for the use of the equipment, (2) the facilities where the equipment is to be located must be open on an equal basis to all members of society, and (3) the equipment may not be moved to another school without prior permission from the Department of Defense. Many schools have already obtained such metal working equipment and some have actually equipped complete machine shops, tool and die-making departments, automatic screw machine departments and/or metal working laboratories. N.I.E.R. equipment may mean a savings of nearly $150,000 in budgets for each of these types of facilities.

(3) *Equipment From Industries* Since local industries are the ultimate receivers of most of the individuals trained by vocational-technical programs, responsibility is sometimes the valid motivation for a loan or gift of equipment valuable for teaching skills and technical information. Care in accepting such equipment gifts must be exercised here also since some industries that are in the provess of updating their own facilities may be inclined to ship obsolete and out-dated equipment to the nearest training facility.

Facility planners must make and defend fundamental decisions on whether teaching values are possible through the use of equipment approaching obsolescence, or whether money spent for the purchase of new equipment is justified at any price. When in doubt, facility planners should work closely with the craft, advisory or consulting committees to be sure that the curriculums reflect current practices in teaching methods and techniques, as well as in equipment and facilities.

Laboratory Design

Conventional laboratory design which provides furniture and individual work stations placed at regular intervals across the breadth of the laboratory fails to meet the frequent requirement in vocational-technical education for individualized instruction and for occasional group demonstration. Instead, a design which more appropriately meets the needs places furniture along the walls of the laboratory, leaving a wide expanse of open floor in the middle to use for large scale demonstrations.

The cleared center area will also provide excellent opportunity for group discussions and conferences and for the display of large pieces of equipment.

Illustration O.

The central or island type of installation eliminates the possibility of transporting new and improved items of shop equipment directly from the trade and industrial education shops to the science laboratories for study. For example, in the applied or "related" science laboratory, the teaching requirement includes not only basic concepts but also the application of the concepts to work situations in terms of occupational preparation. On one occasion the open middle section of the science laboratory may hold the complete front section of an automobile for intensive study of anything from the laws of levers to steering mechanisms and linkages. On another occasion, the center section might hold a cut-away section of a "retired" submarine periscope for the study of the principles. and concepts of optics. Thus, laboratory instruction of a "related" or applied type may be more easily conducted with a perimeter arrangement of furniture.

Illustration P.

CHAPTER 6. FACILITY SUPPORT FACTORS

Library Facilities

Sometimes, factors bearing on a student's decision to attend a given school or take a particular curriculum have little relevance to curriculum content or subsequent employment potential. Facilities for student social life, athletics, and activities which potential students normally associate with school often greatly influence his decision.

Planners of vocational-technical education facilities should carefully consider the space and facilities required to house technical publications, books and other reference materials in the usual school library, and often in other strategic locations. The school library which provides for vocational education must include on its shelves not only books relating to the "applied" occupational instruction in the school, but also selections relevant to general education interests of vocational students.

In the case of the area vocational service center, it will be necessary to provide a technical and trade library for reference purposes, while maintaining the general education libraries of the "home" school. Obviously, where complete area facilities are provided, a complete secondary school library must be provided. In planning library space, formulas used by the American Library Association concerning numbers of books per student, as well as table space and seating, should be especially useful. However, due to the nature of the reference work conducted by vocational-technical students and the frequency of their use of reference libraries, maximums rather than minimums in the formulas should be used.

Food Service Facilities

It is understandable that unless the vocational-technical education facility has efficient and satisfactory food service facilities, at least similar to those enjoyed by academic students, student morale and eventually enrollments may be adversly affected, regardless of the programs offered. Food service design assistance should be sought, particularly in the case of the area vocational schools (service centers or complete vocational schools). Whether to construct, equip, staff and operate a school cafeteria, or to conduct the food service facility on a self-service, coin-operated basis, would depend on such advice. Obviously, the latter choice would make unnecessary a kitchen, its equipment and staff. Somewhere between these two alternatives is the use of one or more snack-bar facilities which may or may not offer hot food of several kinds.

To repeat, unless the equipment and facilities for study, social activitites, physical education, athletics and food service are equal those of the schools from which potential students come, it is doubtful that potential enrollees will give serious consideration to enrolling in vocational-technical education programs.

Illustration Q.

Physical Education Facilities

The competition for quality students in academic programs and in vocational programs has become quite keen. Students, right or wrong, often make choices based on "extra curricular" factors. In the comprehensive secondary school, and in the area vocational service center, the physical education needs are usually met in the home school. In the separate area vocational high school, special attention must be given to providing these special facilities. Planners must recognize and provide for the needs of students attending vocational programs, particularly where these physical health programs are not part of a comprehensive high school, to satisfy the physical health activities required of all secondary school students.

Sometimes the possibility exists to combine a gymnasium and an auditorium into a single facility. Such a "gymnatorium" might function well in meeting the needs of the students in the physical education and gymnasium activities programs and also meet most of needs of the institution for auditorium activities. Some obvious difficulties may arise when extensive use of both functions are planned within the same facility - such as the time lost for conversion and the damage to gymnasium floors. However, the factor of construction dollars saved would have to be considered and balanced against the difficulties. The ultimate use may be the best rational for making a decision.

Combination type facilities usually never completely satisfy the requirements of any single activity. It is strongly recommended that before a decision is made to use a combination type facility, such as a gymnatorium, an exhaustive study be made by the facility planners to determine the priority of needs and the best solutions available. The planners should attempt to satisfy as many needs as are permitted by the budget.

Some consideration should be given to projected enrollments since that factor e may control the extent of facility usage. In a large institution, the auditorium should be planned for many educational experiences and diversified community activities. In a smaller institution, rather limited use might preclude building and equipping a complete auditorium.

Factors beyond the school, such as community activities, and the values inherent to bringing the community into the vocational facility for public functions, should receive thoughtful consideration. Hence, separate facilities, or the combining of facilities, are questions that must be resolved by facility planners.

Faculty Offices

While some recently constructed vocational-technical facilities provide for faculty offices, others are devoid of such accommodations. It has been observed that where architects have been the planners, faculty quarters generally have been provided; where vocational people have been the planners, the elimination of such facilities has been quite common. Any planner of vocational facilities should give careful consideration not only to the need for faculty offices, but also to the legal implications where shop teachers are concerned.

In general, teachers prefer to have a small cubicle or faculty office reserved for their reference materials, file cabinet, desk and chair. When not teaching, instructors prefer faculty offices to the usual laboratory or classroom desk and chair. The need for time and some privacy to prepare class lectures, demonstrations and other educational activities, is needed and demanded by many instructors.

Where the decision is made to provide faculty offices, consideration should be given to either grouping faculty offices in one or two large facilities, or separating faculty offices into several smaller facilities. The plan most favored by instructors is that in which two to four instructors share a large space equipped with individual desks, chairs, filing cabinets, and with a telephone available to all. Separate cubicles within the larger area are favored over the large, undivided room. Most instructors strongly object to large facilities which provide for 10, 12 or more cubicles. The interruptions, the inter-visitations, the common use of the single telephone extensions and other similar disturbances, make such facilities objectionable. The result may be inefficient non-use of the facilities arranged in such a manner. Where this happens, teachers may be found in libraries, at home, and working at demonstration tables in laboratories. To compensate for these objections, planners should group not more than two or four faculty offices in any location. Faculty offices at either end of a floor, in either end of a wing, or strategically located throughout a building complex have been found more acceptable and more likely to satisfy the conscientious faculty member who desires reasonable quiet, use of a telephone, and a professional atmosphere.

A definite decision must be made concerning the provision faculty offices for shop (and some laboratory) teachers, inasmuch as provision of these facilities has specific legal implications. Even though the required steps are taken to minimize shop and laboratory accidents, accidents are possible, therefore, it is essential that constant supervision by the teacher be maintained. Hence, it may be inadvisable for an instructor to have an office immediately adjacent to or even enclosed within the laboratory or shop. Should an accident occur while the instructor is otherwise engaged in an adjacent office, it may be successfully argued that the student was not under direct supervision; hence the instructor could be deemed liable. The provision of instructor insurance, or school insurance, is not the most important consideration. Rather, it is the quality of the instructional program and the necessity for constant supervision by the instructor. This legal implication should be taken into account in early planning of appropriate facilities.

This might require that the faculty office for such a teacher be completely eliminated and that a large desk, filing cabinet, telephone and other equipment, be placed directly in the laboratory or shop. The instructor can then teach and conduct associated activities from a central instructional-supervisory location.

Further, separate faculty offices for shop or laboratory instructors may have implications concerning the quality of the instructional program. In shops particularly, where the program tends to be continuous over a three or four-hour period during the day, a separate or adjacent office might mean the withdrawal of the instructor from the teaching situation while he attends to other responsibilities. The elimination of the separate office would permit the instructor to be present in the shop or laboratory on a full time basis. In a sense, this procedure might appear restrictive, but it will legally protect the teacher and contribute to quality of instruction.

Illustration R.

CHAPTER 7. VOCATIONAL-TECHNICAL SHOPS AND LABORATORIES

Location

Locating shops within the organizational pattern of a facility is as important as the identification of the youth and adults it is intended to serve. Whether as part of a comprehensive high school program or as a campus type organization, some educators would prefer to have the vocational shops located some distance from all other school activities. Usually they justify this in terms of the noise level associated with activities such as the sheet metal shop, the machine shop and the automotive shop. Facility planners should carefully consider this matter, however, since to separate the academic from the vocational elements of a program physically tends to separate them philosophically. In a commitment to comprehensive education, this separation may be quite undesirable.

Soundproofing and suitable design of the facilities may make it very practical to include such shops and laboratories within the structure of the total educational facility. At the same time, multiple use of the same facilities with the academic program may be possible. For example, study in the areas of general science, social studies, and guidance to the industrial world, may be made more meaningful having vocational-technical shops in proximity to academic classrooms.

The location of shops may occasionally require that they be apart from the other educational facilities. For example, the factor of shop height may be a major determinant. Some shop facilities in older vocational-technical programs required considerable height to provide for overhead equipment and shafting. However, much modern equipment no longer needs the overhead complementary equipment thus resulting on greatly diminished shop height requirements.

The desirability of "proximity location" for the shops is not easily facilitated without some compromises. Either the classrooms must be slightly higher than necessary while the shops are slightly lower than desired or the shops will have to be located in nearby wings. The need for extra height in carpentry, masonry, plumbing and other building trade shops may dictate the planner's decisions. Thus, while it may be philosophically sound to keep shops, laboratories and other vocational-technical facilities close to the academic program, from a practical standpoint, architectural design and subsequent costs might preclude this procedure. Facility planners should work closely with the architects to effect the greatest efficiency with the fewest compromises.

Types

There are many different kinds of shop and laboratory facilities that may be provided in a secondary level vocational-technical facility. Procedures for determining which shops and laboratories shall be provided have already been described in detail. To a great extent, decisions concerning the curriculums to be offered in the school will reflect employment possibilities either in the immediate region or state. Thus, it is likely that the usual employment opportunities, plus provisions for some of the newer emerging areas of employment, will be reflected first in student-interest questionnaires inventories, and later, in proposed construction. Also, because of the nationwide predominance of certain types of jobs, occupational clusters may be found in many secondary schools. An example of curriculum occupational clustering is shown in the fold-out.

Illustration S. (Double page fold-out)

It should be obvious that identification of general clusters and specific shops is limited; however, the actual number and types may be quite extensive. No further explanation appears to be necessary in order to emphasize that the final choice of shops and laboratories associated with the curriculums to be offered should be the result of considerations identified and discussed earlier.

Sizes

The size determination of the various laboratories and shops is governed by the use planned for the facility throughout the day and evening. Since it is relatively expensive to design, equip and operate shops and laboratories which will receive only limited use for a major part of the school day, the scheduling of these facilities should be such that they will serve as many different groups as possible.

As the institution implements its commitment to the operating policy of "wearing out the total facility in the interest of serving youth and adults", those to be served would include:

(1) full-time vocational-technical education enrollees,

(2) part-time (out of school) enrollees, and

(3) adults.

This could mean the facility would be in use from early morning until 10 or 11 p.m. In a sense, this would produce a utilization of equipment and facilities far greater than normally expected. Equipment in such a high-use program may be worn out in possibly one-half to one-third of normal life expectancy. This factor should be kept in mind when planning budget, equipment replacement, and repairs.

From a positive standpoint, however, "round-the-clock" use of vocational-technical facilities which may wear out equipment in the interest of many individuals and occupational groups, will provide greater returns for the taxpayer's investment. The greater the number of individuals prepared, upgraded and/or updated in their skills, ultimately improving the workforce of the nation, the greater will be the dividends to the national economy and to society in general.

When a facility is being planned, the size of the various groups that will use the facility must be kept in mind. If small day-school groups and large adult and evening enrollments are anticipated, then planners must consider the optimum shop and laboratory sizes to meet the requirements for training all of the groups. This could mean not only "lock-step" scheduling of the facilities to achieve ultimate utilization, but also considerations about concurrent uses of the same shop or laboratory by two different groups of students. For example, it is quite feasible to provide supplementary instruction covering new skills needed by machine shop industrial (employed) apprentices during the same period, and in the same shop, where regular machine shop instruction is being provided for secondary school students.

Theory Instruction Provisions

Attention must also focus on planning for supplemental facilities within shops. These include tool and product storage, provisions for teaching shop theory, the tool room, oil storage, laboratory and washroom facilities, lockers, and other similar items.

In providing facilities for theory instruction, care must be exercised to differentiate between "theory instruction" and "related subjects" instruction, since where theory instruction is conducted is of great importance. *Theory instruction* is that instruction closely associated with the teaching of the occupation, and it includes shop processes, shop procedures, and technical information associated with products, processes, tools and materials. *Related subject instruction,* on the other hand, is that instruction emphasizing the concepts of mathematics, science, layout and design, blueprint reading, etc., through carefully selected applications.

Theory instruction must be provided by a shop instructor either in or adjacent to shop facilities. Related subject instruction may be provided within a shop but can be effectively taught outside the facility. Instructors of related subjects need to have knowledge and work experience in the occupations, but are not generally required to be craftsmen. Hence, whether the planned vocational-technical facility is to be within the comprehensive high school organizational pattern or of the area vocational school or service center category, provisions for theory instruction preferably should be within the shop or immediately adjacent.

With the growth in technology, the requirement that the mechanic, apprentice, technician and others prepared in public vocational-technical programs be equipped with far more technical information than in the past has become a certainty. In earlier days, the emphasis was on the acquisition of manipulative skills, almost to the exclusion of technical information. Some of this information was provided in the course of the skill instruction by the teacher. Usually it applied only to the task at hand. The craftsman, mechanic and technician of today, however, must have skills plus technical knowledge.

Since theory instruction of a direct application nature should be provided by the shop instructor, facilities should be adjacent or included within the shop or laboratory. Often these are provided within a broad "service strip" in the shop and enable the instructor to take a group from the shop to the theory room at will. Such theory rooms should be able to seat 12 to 15 students.

The installation of a demonstration table, wiring for the use of projected visuals, and room darkening facilities are a necessity. The adjacent theory room may provide meaningful instruction via visuals, auditory devices, demonstrations, lectures or several combinations of these techniques.

The theory rooms may have additional use for late afternoon and evening groups, aprticularly for skill training of employed adults. Apprentices and other employed individuals, concerned with supplementary technical instruction, may use the shop theory area during the evening hours without interrupting skill instruction.

In the case of apprenticeship training, where young employed apprentices receive on-the-job skill training and theory in the vocational institution, shop theory rooms serve an admirable purpose. Closely identified with shop activities, and sufficiently close to make theory instruction meaningful, apprentice classes may adjourn to observe the practical application of theory.

Further, where enrollment requires the use of more than one instructor, the theory room is very important. It may be used alternately or rotationally by instructors extensively or even continuously through the school day and evening.

Where enrollments in the various curriculums are small, joint use of theory rooms may be arranged between adjacent shop departments. Thus, a teacher of carpentry and a teacher of sheet metal mechanics in adjoining shops may schedule use of a common theory room. Theory rooms should provide for storage and installation of required demonstration facilities and for utility outlets, such as sewage, air, gas and electricity, to meet the requirements of both departments.

Illustration T.

The Service Strip

The "service strip" has been a highly successfuly shop arrangement and the illustration indicates how various facilities might be included within the shop.

Some shop activities require more extensive provisions than others and this program requirement should be anticipated. For example, a machine shop requires extensive storage facilities for oil, cyanide pellets for the cyanide hardening equipment, room for hardening and tempering activities, steel storage, and small tool storage. A carpentry shop, by comparison, requires far less storage than the machine shop but its service strip would have to provide more storage for bulky materials i.e., lumber, plywood sheets, wallboard, and projects under construction. Inasmuch as facility and space requirements vary with shops, care should be taken in planning to anticipate minor or major changes as the respective programs change to meet the needs of the world of work.

In general, the service strip should provide for a tool room, storage of flamables and other materials, a theory room, and storage facilities for jobs in progress, special materials, and for equipment. Other facilities which should be given consideration include washroom facilities, shop lockers, and lavatory facilties.

Students are generally required to wear special shop clothing related to safety, cleanliness and orderliness. Often they change from street clothes to a shop overall, coverall or other type of clothing. Where this is practiced, it becomes necessary to provide appropriate service facilities. In schools where a common dressing room and a large locker room is provided, students are required to make long trips to and from their respective shops; occasionally, they make a number of trips during a three-hour shop period. Having this facility within the shop area reduces the number of outside corridor trips, and eliminates much of the in-transit supervisory activity.

Furthermore, washroom facilities closely associated with the locker room have other distinct advantages. Circular wash fountains, lavatories and locker rooms, provided within the same area, enable students to arrive in a shop area, dress and move to the instructional area situation in minimum time. When leaving, the same efficiency is effected. The constant movement of students to and from lockerooms, washrooms and shops is almost totally eliminated.

Consideration should also be given to the relationship between the reference center for learning materials within the "service strip". Students make considerable use of reference materials, hand books, recent shop journals and similar publications, related to their ordinary learning experiences; these materials should be readily available. An automotive shop student, for example, adjusting some intricate parts of an automatic transmission, may need to obtain information which can be found only in a specific manufacturer's publications. To require him to go to the central library or, in all probability, go to a centralized washroom to clean up before going to the library, would be discouraging and an inefficient use of time. Thus, providing such adequate resource materials, files, bookcases, and display cabinets within the shop is imperative.

Lighting for Classrooms, Laboratories and Shops

The lighting requirements for each shop must be carefully studied. Lighting requirements in one kind of shop activity may be quite different from another; individual dropcords to a bench in one case, or broad overhead continuous fluorescent lighting in another.

The detail and intricacy of the work may require quite different kinds and levels of lighting. For example, where instruction in watch, clock and instrument manufacturing is being conducted, concentrated local illumination is not only a necessity but an extremely effective procedure. On the other hand, because of the broad areas of utilization, carpentry, plumbing, and building finish operations require less illumination and therefore a different type of illumination.

Illustration U.

The same type of consideration must be given to other types of shop activity. In activities such as mechanical drafting, architectural drafting, and in art and design layout, the elimination of shadows is a factor which determines the type of lighting. On the other hand, where shadows are less critical, such as in an automobile shop, general lighting may be adequate.

Some consideration may also be given by planners to the complete elimination of fenestration in the building. The object would be to provide appropriate lighting in each specialized study or shop area without reference to exterior light. Some vocational facilities have been constructed along these lines and report reasonably good results. The elimination of windows in classrooms, laboratories and shops has had both positive and negative reaction by teachers and students using the facility, and result in no clearcut decision either way. Of interest is the general observation that classrooms equipped with windows require venetian blinds or other devices to control the light in the room. Unless such blinds or devices eliminate about 75% of the entering light, it would be almost impossible to use certain kinds of projected visuals. This calls for a special kind of venetian blind, usually of the interlocking slot type.

No attempt has been made here to recommend one procedure over another. The planner should work closely with the architect to identify the illumination needs by areas and where the natural light may be utilized or may need to be controlled.

The control of natural light involves shops and laboratories with windows facing the south, east and west. Light is, of course, essential in most shop activities, and an abundance of it is generally good. However, large uncontrolled amounts of sunlight can be extremely detrimental. It may be necessary to consider the use of heat absorbing, glare reducing and tinted glass where direct sunlight enters the shop or laboratory area. These are problems for the architect to solve.

Since changes made after construction has started are costly, the planner should identify the illumination needs early so the architect can incorporate them into the original plans. As discussed earlier, planners should consider whether natural light is necessary at all. With late afternoon and evening classes, natural light is virtually nonexistant and high level artificial illumination is the only possible consideration.

Laboratory Characteristics

Instruction in the sciences which includes physics, chemistry, metallurgy, testing materials and other similar subject matter areas, bears a strong relationship to the related shop instruction. Since laboratory science instruction is identified under most federal vocational education reimbursement programs as "shop related science", planning should anticipate keeping the science instruction as nearly related and applied as humanly possible. This implies extensive communication between the shop and related departments, fostering regular (even constant) student visitations between departments with the instruction so closely associated physically that the "relatedness" of the shop related science instruction is apparent to the student.

In the related science laboratories, adequate facilities for the movement of equipment in and out of the laboratory should be planned. This means that large overhead I-beams and chain hoists may be necessary, along with the ready availability of a fork-lift truck. Thus, some of the large motor or engine assemblies, for example,may be transported into the science laboratory where instruction may be made meaningful to the student. Also, the transfer of a piece of electrical hardening equipment into the science laboratory would enable students in the metal trades to study the principles of hardening and tempering.

Illustration V.

Attention should also be given in the planning stages to doorways, both for height and width. Double doors of sufficient height should be provided on the corridor side of the laboratory and some thought may need to be given similar doors and loading docks on the exterior side of the laboratories. Frequently, the opportunity to relate instruction is facilitated by the lending of modern equipment by a manufacturer, a business corporation or a machine tool distributor in the area.

Laboratories for vocational-technical programs require extensive provisions for water, air, gas, and electricity. Considerable emphasis is placed on individual types of experiments, as well as instructor demonstrations. Frequently, small scale control panel boards are provided within the laboratory for distribution of electrical inputs to the individual student station and to the instructor's demonstration table. The need for an electrical distribution panel is apparent when one considers the wide variety of electrical experiments anticipated. These include experiments running from low-amperage plating to high-amperage metallurgy. For experiments in heat-treating and metallurgy, high wattage is required and 220-volt service is essential.

Illustration W.

The constantly changing nature of instruction in the sciences demands maximum flexibility as to type and location of equipment within the science laboratory. To facilitate this, overhead electrical power bus ducts have proved to be most useful. They are evident in the planning and construction of most new vocational-technical programs. These bus ducts contain all of the necessary power outlets and facilities for making rapid connections to new equipment installations or to temporary installation of borrowed or rented equipment.

In comprehensive high schools, the need for several kinds of science instruction must be planned so that both the science instruction for the college-oriented youth and the applied or "related science" of the vocational student receives appropriate emphasis. Laboratory facility planners should study carefully the possibilities of providing for both groups in common facilities, especially where enrollments indicate this to be feasible.

Entering into the planning factors would be (1) anticipated growth of enrollment in the vocational-technical programs, (2) use of laboratory facilities by adult groups, and (3) the possibility of extensive daytime use of laboritories for up-dating and up-grading. Should the decision be made to combine the science laboratory instruction in a common facility, care must be exercised to insure that the characteristics of instructional efficiency are maintained.

Storage for laboratories is generally a problem, but efforts should be made in planning new facilities to provide at least one adequately sized storage facility between each pair of laboratories. A chemistry laboratory and a physics laboratory may easily share a common storage facility. These need not be extensive in size, but should contain the necessary metal and wooden racks and standing shelving, which will provide for storage of glassware, experimental equipment, and essential supplies.

Science laboratories are often the center of motivation for the student. A well-equipped laboratory is more likely to motivate than an ill-equipped one. Planners of vocational facilities should take into account the physical dimensions of equipment used, since the square-foot requirement of each laboratory will depend on whether or not standard size commercially used equipment is installed at the time of construction or later, or whether small models of the same type of equipment are used.

Modern and commercial full-sized equipment for science laboratories may be quite expensive but quality equipment always provides a more effective and efficient basis for the instructional program, and it really may be more economical than "bargain" or surplus equipment. Government surplus equipment, or other kinds of "reasonalby priced" equipment,can be considerably expensive in a number of ways:

(1) it may be quite costly to maintian in good condition,

(2) costly to replace worn parts, and

(3) difficult to explain principles which cannot be demonstrated on on an inadequate model.

All this *wastes* the valuable time of both student and instructor. Further, modern commercial equipment provides an instruction level of accuracy and speed that cannot be achieved by inexpensive equipment. Since students are being prepared for the world of work, it is essential they learn the principles and note the degree of accuracy achieved with commercial equipment. Adequate space must therefore be provided to house this equipment and additional floor space should be carefully considered in the original planning.

Also, because of the costs involved in the purchase and maintenance of commercial models of laboratory equipment, the teaching methodology within the laboratory must be varied on occasion. A single piece of Tensile testing equipment with a 200,000 pound capacity is all that is generally needed for a metallurgy and testing materials laboratory. Thus, students who use the equipment may be organized into small groups, or to individually experiment with tensile and compression testing. However, single pieces of commercial equipment is about all that a secondary school program can consider, so instruction in the laboratory of necessity may be individualized rather than class or large group instruction.

By way of further emphasis, it should be noted that science laboratory facilities in a vocational-technical school will be used by many different groups. During the late afternoon and evening hours, apprentice groups and employed adults will also need to use the science laboratory. To use other than commercial types of equipment where these individuals are concerned would be questionable. Many of the employed adults and apprentices would see and use similar items in their own places of employment. Early in the planning process, multiple use of equipment should be given adequate consideration since the sizes of laboratories will be determined at the same time.

Number of Laboratories

The actual number of different laboratories will depend partially on the enrollment in the total educational program. On occasion, the combination of a physics and chemistry laboratory may be the wisest and most economical arrangement. In schools with large enrollments, however, separate facilities with emphasis on a single scientific discipline might be required.

One of the factors bearing on the need for multiple laboratory facilities is the scheduling of students into instructional areas. The decision concerning when a subject shall be studied is of great importance. Tradition often plays a greater role in that decision than the student's learning capabilities. Careful student scheduling, varying the grade level when students are assigned to a particular area of study, may make it unnecessary to have more than one of any kind of science laboratory. This, of course, would result in considerable savings. Since about 25% of all student time generally is in one or the other of the science laboratories, and since class sizes in the laboratory is generally about 15 to 20 students, the planner should be able to make initial estimates concerning the number of laboratories needed.

Occasionally, some danger is present when laboratory experiments are being conducted. The chemistry laboratory is one place that has a particular need for safety provisions. It is recommended that a high-pressure shower head and shower ring, or the new type bubbler, be placed in a convenient, open location. Students who accidentally spill acid on themselves, or get it in their eyes, may reduce damage to themselves or to their clothing by prompt application of water. A floor drain and the necessary sewage piping is a part of the installation requirements.

Illustration X.

An additional facet of laboratory construction for planners to consider involves the glass partitioning of a small, separate area of the laboratory. This area should include a demonstration table and space for about 15 to 20 tablet armchairs. The instructor can then conduct a demonstration for a small group of students while at the same time have visual supervision of individual experimentation by other students in the laboratory. This divided facility could also be used by late afternoon and evening adult groups, making it possible to handle two entirely different groups within the same laboratory. In addition to serving employed adult groups with a wide variety of needs there is a growing demand for small meeting or demonstration rooms.

Classrooms Needed for Vocational-Technical Education

If the vocational-technical program is planned as part of a comprehensive high school unit, calculations for the number of classrooms should anticipate use by:

(1) vocational-technical students,

(2) college preparatory students, and

(3) general education students.

Frequently, multiple use of classrooms by these three groups may actually make it possible to schedule the classrooms for 80% of the school day or more.

While efforts to achieve nearly 100% scheduling should be made, the arbitrary 80% may be considered a reasonable measure of utilization. Generally, students will spend approximately 50% of their school time in the trade shop, 25% in the science laboratories, and 25% in the classrooms. Thus, approximately one-quarter of the total enrollment will need classroom space throughout the school day. To determine how many classrooms will be required, the planner must first consider the subject areas taught to determine how large the classes may be. Vocational-technical education class sizes vary somewhat throughout the nation, but for planning purposes, the following may be considered average:

(1) General Education - English and social sciences:
classes of 25 to 30.

(2) Related Subjects - Mathematics, science, etc.:
classes of 15 to 20.

Some consideration should also be given to the use of classrooms by others within the comprehensive high school program. Planners may find it necessary to design classrooms for the largest class using them. If planning for a separate area vocational school, similar calculations can be made; however, smaller classrooms would be satisfactory.

Another factor planners should be aware of is the use which may be made of shop theory rooms. If small classes of 10 or 15 students are involved, consideration should be given to making use of the several theory classrooms. Planning of this nature may actually reduce the numbers of classrooms needed.

Much classroom instruction provided in vocational-technical programs requires extensive use of handbooks, reference books, slide rules and other items of equipment. The necessity for good student work space with opportunity to spread out the work often requires the use of tables, as in the related mathematics classrooms. Facility planners should consider the school requirements of vocational education in the classrooms and make space calculations accordingly. Generally, the usual space allocations for classes in English and the social sciences will be adequate but it may be well to provide additional space for the related subjects such as mathematics.

Administrative Units

Because of the nature of vocational-technical education, administrative and supervisory services not found in the usual academic program must be provided, each requiring space for personnel and office equipment. These services, unique to vocational-technical education, include extensive adult education activities as well as apprentice training. Graduate follow-up, as a requirement under the law, is another area of activity which requires space in the administrative unit. In general, the program of vocational-technical education will require all of the usual space needed in conducting a regular high school administrative function plus additional office space for:

(1) an apprenticeship coordinator,

(2) an adult education supervisor,

(3) a graduate follow-up coordinator, and

(4) a director of vocational-technical education.

The administrative unit should be close to the regular administrative functions if the vocational-technical program is to be conducted within the comprehensive high school as an operating unit. When feasible, some economies may result by combining all administrative functions into single offices. Enrollments in the various vocational departments obviously are factors to be considered. For a small enrollment situation, a common guidance-counseling office could be used to serve the needs of the entire comprehensive high school.

Where the vocational-technical education program is conducted in a separate area vocational school, administrative facilities should follow traditional secondary school patterns. Additional facilities are added as needed to conduct apprenticeship training, adult education and graduate follow-up activities.

Illustration Y.

The administrator of the institution should have, immediately adjacent to his office, a generous conference room equipped to comfortably seat approximately 20 people. Such a conference room will handle the industry advisory and consulting committees required under the law, and so critically needed as a source of current information. Use of such a confernece room will be quite heavy; therefore, entrance to the outside corridors from the conference room should be incorporated in the planning.

Adjacent to the superivsory offices should be space for the student personnel officer, who is responsible for placement of students, follow-up of graduates, and management of many aspects of the work-study program. The student personnel officer represents one of the important focal points of vocational-technical operation. Adquate space must be provided for those responsible for these activities, and for clerical and secretarial services associated with their services.

With regard to space for clerical and secretarial services, a planner's rule-of-thumb might be: 2 persons plus 1 additional person for each 100 day school students. In a program with an enrollment of 600, the secretarial and clerical staff would be 2 + 6, or a total of 8. This may appear to be a fairly large staff, but vocational-technical program requirements are such that these personnel are necessary. Also, additional clerical and secretarial personnel will be needed to staff the adult, extension, apprenticeship and other aspects of the total program.

Planners of facilities must take all of the foregoing into account in the identification of the initial facilities. They must also give careful consideration to the location of the total administrative unit to the end that it will be possible to provide additional space as the program grows. Competent architectural advice is essential throughout such planning, since competent architects will incorporate flexibility in their creative design of functional, economic and aesthetically pleasing facilities serving the objectives and aspirations of vocational-technical education.

APPENDIX

Exhibit A. Covering letter for student interest survey.

Exhibit B. Student interest survey.

Exhibit C. Parent interest survey.

Exhibit D. Covering letter for school guidance counselors.

Exhibit E. Guidance personnel survey.

Exhibit F. Covering letter to local employers.

Exhibit G. Survey of industries.

EXHIBIT A. Covering Letter for Student Interest Survey.

VOCATIONAL-TECHNICAL EDUCATION SURVEY
_________________________Public Schools

________________,19__.

To the students in Grades 8 and 9

A study is being made in this area to determine how the public schools can be of help to students who wish to prepare themselves for jobs in the fields of industry, business, hospital and nursing home work, selling, advertising and other kinds of work. You may have thought about this matter and have some ideas about what kind of vocational-technical training you might like to have in your high school years.

We would like you to answer the following questions as carefully as possible, and return the questionnaire to your teacher. Thank you for your help.

Very sincerely,

EXHIBIT B - Student Interest Survey

VOCATIONAL-TECHNICAL EDUCATION SURVEY

Questionnaire to Junior High School Students (8th and 9th Grades)

Personal Data

1. Name____________________________________Phone________________
2. Home Address____
3. School____
4. This questionnaire is being answered by: 8th Grader______ 9th Grader__
5. This questionnaire is being answered by: Male_____ Female__________
6. Please check the appropriate statement below:
   - a. ______ I do not plan to attend a school to learn a vocation and to prepare for a job.
   - b. ______ I plan to attend high school and enroll in:
     - 1. ______The college preparatory curriculum
     - 2. ______The general business education curriculum
     - 3. ______The general course
   - c. ______I would like to enroll in a vocational-technical school and prepare for getting a job.
7. At high school the college preparatory program which I plan to enter should prepare me for:
   - a. ______Engineering
   - b. ______Liberal Arts
   - c. ______Education
   - d. ______Other (specify)

     ____
   - e. ______Science
   - f. ______Business
   - g. ______Medical
   - h. ______Uncertain at this time.

     ____

EXHIBIT B - Con't.

NOTE: If you checked question 1c, please anser the following question:

8. If possible, I would like to enroll in a vocational-technical curriculum like the one I have checked below.

Business Occupations and Office Occupations

a. ________Selling and Salesmanship

b. ________Bookkeeping and Accounting

c. ________ Secretarial Work

d. ______Clerical Work

e. ______Data processing

f. ______Advertising, layout and design

g. ____________________________

Agriculture Occupations

a. _____General farming

b. _____Poultry raising

c. _____Dairy farming

d. _____Soil conservation

e. _____Farm equipment repair

f. _____Selling farm products

g. ____________________________

Health Occupations

a. _______ Practical Nurse

b. ________Nurse's Aide

c. _______ Diet kitchen worker

d. _____X-ray technician helper

e. ____ Dental Assistant

f. ____________________________

Trade and Industrial Occupations

a. ______ Appliance Repair

b. ______ Automotive Repair

c. ______ Automotice Mechanic

d. ______ Carpenter

e. ______ Cook and Baker

f. ______ Cosmetology

g. ______ Sheet metal mechanic

h. ______ Mechanical Drafting

i. _____ Electrical Maintenance

j. _____Architectural Drafting

k. _____ Heating, Air Conditioning & Refrigeration

l. _____Metal Pattern Making

m. _____Sewing Machine Mechanic

n. _____Printing

o. _____Machinist

p. _____Bricklaying and Masonry

q. _____Office Machine Repair

r. _____Optical Mechanic

s. _____Painting and Decorating

t. _____Plumbing

u. _____Radio and Television Repair

v. _____Welding

w. _____Tool and Diemaking

x. ______________________________

EXHIBIT B. - Con't

9. If all goes as I plan, I will continue my education beyond high school at

   a. _____ a 4 year college or university

   b. _____ a junior college

   c. _____ a community college

   d. _____ a school of nursing

   e. _____ a private business school

   f. _____ a private beauty culture school

   g. _____ a technical program in a technical institute

   h. _____ a trade program in a technical institute

   i. ____

10. _____ At his time, I do not plan to attend any school immediately after I graduate from high school.

11. _____ I would like additional information concerning:

   a. _____ Trade and industrial training

   b. _____ Technical training programs

   c. _____ Preparation for occupations in the health, hospital, nursing home field

   d. _____ Training for occupations in the business field.

   e. _____ Office occupations in the business field

   f. _____ Programs to prepare me for agricultural occupations

   g. _____ Other ______________________________________

12. In our school we learn about the world of work and the kinds of jobs that we can be trained for:

   a. _____ From our guidance counselor

   b. _____ From our home room teachers

   c. _____ From films that are shown to us

   d. _____ By visits that we make to industries or stores or farms in the are

e. _____ From television programs that we watch in school

f. _____ From television programs that we watch at home

g. _____ From the work that we do in the industrial arts shops

h. _____ From the work that we do in the home economics classes

i. _____ By talking with fellow students

j. _____ By talking with our parents and relatives

k. _____ From books and magazines that we read

l. _____ From the man from the vocational school who comes to talk to us.

m. _____ ____

EXHIBIT C - Parent Interest Survey

PARENT INTEREST SURVEY

NAME____________________ ADDRESS____________________

FATHERS OCCUPATION______________FIRM__________LOCATION_______

MOTHERS OCCUPATION______________FIRM__________LOCATION_______

SCHOOLS ATTENDED BY YOUR CHILDREN__________________________

NUMBER OF BOYS______________GRADES______________

NUMBER OF GIRLS______________GRADES______________

1. How much education do you plan for your children?

   High School __________College__________Other__________

2. a. Would you like to have your children enroll in a vocational-technical course as a part of the regular high school program in order to prepare them for an occupation suited to their interests and abilities? Yes___ No___

   b. Would you prefer that your children receive this training after graduating from high school? YES ______ NO________

3. If adult members of the family would be interested in vocational classes, please check the general areas of interest:

   a. Courses to complete high school graduation______________

   b. Courses for general personal satisfaction______________

   c. Courses to improve trade, industrial or technical skills and knowledge__

   d. Courses in homemaking______________

   e. Courses in business occupations______________

   f. Courses in agricultural occupations______________

4. List subjects in which you are especially interested______________

   ____

5. Please make your comments here:______________

____

____

EXHIBIT D - Covering letter for school guidance counselors.

VOCATIONAL-TECHNICAL EDUCATION SURVEY
__________________________Public Schools

________________________, 196__

Dear School Counselor:

A Vocational-Technical Survey has been authorized for the schools. The purpose of the survey is positive in that it is seeking information which will form the basis for recommendations which should lead to the improvement of the vocational education program of the area.

The enclosed questionnaire has been prepared by us to secure from guidance personnel in the schools information related to certain phases of the study. The questionnaire need not be signed but you will note that your copy is coded in the upper right-hand corner. This is done in order that our office may compile the returns by appropriate categories and yet protect your identity as a respondent as well as the identity of your school. Please be assured that your replies will be treated in a most professional manner by our Survey Staff.

You will observe in completing the questionnaire that our attention is focused upon specific aspects of the guidance program, particularly those services related to course selection and career planning. This is intentional due to the nature of our survey. It in no way implies that we consider your guidance responsibilities to be so limited.

May we hope for your prompt assistance? The questionnaire is quickly and easily completed, and we are sending a business-reply envelope for your convenience. Thank you.

Very sincerely,

EXHIBIT E. - Guidance personnel survey.

VOCATIONAL-TECHNICAL EDUCATION SURVEY

Code__________

Questionnaire to Guidance Personnel

1. To what extent can students in your high school who are taking a college preparatory program fit into their schedule courses such as typing, home economics, and industrial arts?

   To a great extent _____ To some extent_____ Not at all________

2. To what extent do students in the college preparatory program take such courses as typing, home economics, and industrial arts?

   Much________ Some ________ Little________

3. Courses such as industrial arts and home economics are sometimes held in less esteem than are the typical college preparatory courses by both pupils and parents. To what extent is this the case in your school?

   To a great extent_____ To some extent________ Not at all______

4. Does every pupil in your school participate in Group discussions of course selection and career planning? Yes_____ No_____

   If yes, in what grade(s) does this take place?____________________

   How is it accomplished? (e.g., regular homeroom program, part of guidance class, part of required course, etc.)

   ____

5. To what extent is provision made for individual counseling with pupils on problems of course selection and career planning?

   To a great extent_________ To some extent_____Not at all_________

   In what grade(s) does such individual counseling take place?_______________

6. To what extent does each of the following apply in your school with respect to individual counseling?

	Much	Some	Little
a. Every pupil is scheduled for an individual conference	_____	_____	_____
b. Individual problems are usually handled during group meetings	_____	_____	_____
c. Pupils with problems or conflicts may confer with a counselor or guidance person	_____	______________	

	Much	some	little
d. Someone (counselor, homreoom teacher, principal, etc.) reviews course and program choices and calls in pupils who seem to need assistance	_____	_____	_____
e. Assigning pupils to classes is basically an administrative function; and only those pupils who complain are seen	_____	_____	_____

7. Is a serious attempt made to encourage parents to participate and help students in the program of course selection and career planning?
Yes _______ NO____________

If yes, approximately what percent of the parents are usually involved?_______

How is it accomplished? (e.g., require parents' signature on course choice form, hold organized group program for parents, schedule conference with parents, etc.)

____

8. What techniques does your school employ to assist pupils in making wise educational and vocational plans? Indicate extent of use by checking in the appropriate blank for each of the techniques and methods listed below.

	Regularly	Occasionally	Seldom or never
Organized group guidance program	________	________	________
Individual counseling	________	________	________
Information about pupils:			
Cumulative record data			
Test data	________	________	________
Educational & Occupational information	________	________	________
Exploratory courses	________	________	________
Visits to:			
High School vocational classes			
Business, industry, health establishments	________	________	________
Vocational or technical schools	________	________	________
Colleges	________	________	________
Programs for parents:			
Group sessions			
Individual conferences	________	________	________
Other (specify)________________	________	________	________

9. Has your school established specific requirements for admissions to vocational courses? YES_________ NO____________

10. What kinds of pupils are recommended for vocational courses? Rate each of the following as it operates in your school.

EXHIBIT E - Con't.

	Usually	Sometimes	Rarely
Those of high academic ability, provided they have made a vocational choice.			
Those who have difficulty with academic subjects			
Chronic trouble makers			
Those from low-income families			
Those who have specific interest in vocational courses.			
Those who have demonstrated ability along vocational lines.			
Other (specify)____________________			

11. To what extent do you think the citizens of the community feel that the school is meeting the vocational education needs of the pupils?

To a great extent_____ To some extent__________ Not at all__________

12. To what extent do you think that your school is meeting the needs of the non-college bound pupils?

To a great extent_______ To some extent_________ Not at all_________

13. How good a job is your school doing in each of the following?

	Good	Average	Poor
Educating young people for adult living			
Providing a good foundation for students who wish to go to college			
Preparing students to earn a living			

14. Should public education in the schools prepare youth, not planning to attend college, for entrance into jobs such as sales, office, skilled crafts, health services, etc? YES___________NO___________

If yes, indicate the type of school(s) which should provide this education and indicate your preference by numbering your first choice "1", second choice "2", etc.

a. Local comprehensive high schools______
b. Local vocational and technical high schools_____
c. Area vocational and technical high schools______
d. Area vocational and technical post-high schools_____
e. Junior or community colleges____
f. Other (specify)________________________________

If answer to item 14 is no, please give reason(s).

____

15. Please add any opinons or comments that you believe will assist those responsible for conducting this survey of vocational-technical education.

EXHIBIT F - Covering letter to local employers.

VOCATIONAL-TECHNICAL EDUCATION SURVEY

_______________, 19___

Dear Sirs:

We have been authorized to conduct a study of vocational-technical education for the area. The purpose of the survey is positive in that it is seeking information that will form the basis to recommendations which should lead to the improvement of the vocational educational programs in the area.

As an employer, or potential employer, of the young people of this area, your industry can be of value to the survey by providing certain information and opinions related to the study. One of our several survey techniques is a mail questionnaire to industries in the area. Enclosed is your copy of the questionnaire. We hope that it will be answered by the person(s) in your organization best suited to respond.

You will note that your questionnaire is coded in the upper righthand corner. This is done to enable our office to compile the returns by appropriate categories and still protect the identity of your industry. Your replies will be treated in a most confidential manner.

A business-reply envelope is enclosed for your convenience in returning the completed questionnaire. We trust that your questionnaire form will be completed carefully, frankly, and promptly. Thank you for your anticipated cooperation.

Very sincerely,

EXHIBIT G - Survey of Industries

Code________

VOCATIONAL-TECHNICAL EDUCATION SURVEY

Questionnaire to Industries

DEFINITIONS AND EXPLANATIONS

Graduate engineer - A "graduate engineer" is an employee who has graduated from an accredited four or five year collegiate program in engineering.

Graduate chemist - A "graduate chemist" is an employee who has as minimum preparation the completion of a four-year collegiate program in chemistry.

Technician - In general, a "technician" is an employee whose activities are directed chiefly toward the application and operation of scientific equipment and processes. Some typical functions performed by the technicians are those dealing with design, development, and testing, generally under the direction of a professionally prepared person such as a graduate engineer or chemist.

Technician (industrial) "A": Close to craftsman or tradesman; often has an abundance of hand skills. Usually has only a high school diploma. Examples of technian "A" occupations:mechanical draftsman, worker in communications electronics (including TV), industrial chemistry worker, chemistry technician, etc.

Technician (engineering aide) "B": High level of mathematics and sciences, close work with engineers; develops prototypes, carries out engineering plans. Usually has two years of study beyond high school. Examples of Technician "B" occupations: assistant production engineer in a factory, electrical power plant operator, sales engineer, assistant to plant metallurgist, quality control technicians, etc.

Skilled craftsman - A "skilled craftsman" is an employee whose interests and activities are directed chiefly toward the interpretation of specifications, the operation of a variety of tools and machines to change the shapes of materials, and the fitting, assembling, inspection, and servicing of manufactured products.

- - - - - -

Section A - General Information

1. Number of persons now employed by your company:
   a. Total number of employees__________
   b. Secretarial & Clerical workers__________
   c. Graduate engineers*__________
   d. Graduate chemists*__________
   e. Technician A*__________
   f. Technician B*__________
   g. Skilled craftsman*__________
   h. Operators of equipment (single skill)__________

---

*See definitions above.

EXHIBIT G - Con't

2. In what fields are technicians used by your company?

____

____

____

____

3. Where do you get your technicians now? (Please check or provide appropriate response(s).

- a. Out of State____________
- b. Train them ourselves______________
- c. Employ individuals and send them to school__________
- d. Attract them from other employers__________________
- e. No problem at all to get the number we need__________
- f. Extremely difficult to secure the type of technicians we need__________
- g. Don't need any__________
- h. Other (please specify)____

____

4. What has been your experience with technicians you have employed directly from:
- a. schools in the state: Good ____Fair_______ Unsatisfactory____________
- b. schools out of state: Good_____Fair_______ Unsatisfactory____________
- c. industries in the state: Good____Fair____Unsatisfactory______________
- d. industries out of state: Good____Fair____Unsatisfactory______________

5. To what extent does your company utilize as technicians engineering school dropouts (persons who do not complete the baccalaurate program in engineering)?

[✓ Very much]_______ Some_________Very little__________

6. To what extent does your company advance or employ skilled craftsman as technicians?

Often __________On occasion___________Never______________

7. How do you think technicians ought to be prepared for employment?

- a. By on-the-job training by the industries employing them_____
- b. By special schools in industry_________
- c. By public high schools_________
- d. By public post-high schools_____________
- e. By private schools____________
- f. Other (specify)____

____

EXHIBIT G - Con't.

8. What general education and technical information should be emphasized in the preparation of technicians? Please check in the list below and add any important ones not listed.

	Technician A	Technician B
English (communication)	________	________
Report writing	________	________
Economics of "free enterprise"	________	________
Good grooming	________	________
Ability to get along with others	________	________
Mechanical drawing	________	________
Blue print reading	________	________
Simple mathematics	________	________
Trigonometry	________	________
Physics	________	________
Chemistry	________	________
Other ____________________	________	________
____________________	________________	
____________________	________	________

9. Which manual skills should be emphasized in the preparation of technicians?

Technician A	Technician B
____________________	____________________
____________________	____________________
____________________	____________________

10. How many additional technicians will be needed by your local industry (considered by us as highly confidential):

	Replacement		Expansion	
	Technician A	Technician B	Technician A	Technician B
a. a year from now?	____	____	____	____
b. in two years?	____	____	____	____
c. in five years?	____	____	____	____

11. In terms of your own industry, in what fields do you expect that technicians will be needed in the future (considered highly confidential)?

____

____

12. How great a shortage of technically prepared personnel do you believe there is in the area?

Very great________Average__________Very small____________

EXHIBIT G- Cont.

Section B - The Vocational-Technical Programs of the Secondary Schools

1. How familiar are you with the:
   a. trade, industrial, health services occupations and technical program of the area secondary schools?

      Quite familiar ________ Fairly familiar________ Unfamiliar__________

   b. business and distributive education (commercial) programs of the high schools?

      Quite familiar ________ Fairly familiar_________ Unfamiliar_______

2. The instructional programs listed below are or may be offered in one or more of the schools of the area. What is your reaction to each?

Program	Reaction
Auto Body and Fender Repair	Continue as is___Expand___Reduce___Abolish___
Automobile Mechanics	Continue as is___Expand___Reduce___Abolish___
Beauty Culture	Continue as is___Expand___Reduce___Abolish___
Carpentry and Millwork	Continue as is___Expand___Reduce___Abolish___
Commercial Art	Continue as is___Expand___Reduce___Abolish___
Commercial Food Service	Continue as is___Expand___Reduce___Abolish___
Data Processing and Business Machine Operation	Continue as is___Expand___Reduce___Abolish___
Electrical Construction	Continue as is___Expand___Reduce___Abolish____
Machine Shop	Continue as is___Expand___Reduce___Abolish___
Plumbing and Pipefitting	Continue as is___Expand___Reduce___Abolish___
Practical Nursing	Continue as is___Expand___Reduce___Abolish___
Printing	Continue as is___Expand___Reduce___Abolish___
Radio and Television	Continue as is___Expand___Reduce___Abolish___
Secretarial	Continue as is___Expand___Reduce___Abolish___
Technical Industrial Chemistry	Continue as is___Expand___Reduce___Abolish___
Technical Drafting	Continue as is___Expand___Reduce___Abolish___
Technical Electrical	Continue as is___Expand___Reduce___Abolish___

3. Are there other curriculums that you think should be offered to help meet the industrial needs of the area? YES__________ NO__________

   If yes, which curriculums?____

   ____

   ____

   ____

EXHIBIT G-Con't.

4. To what extent are the vocational graduates of the area a source of employees for your industry?

Very much__________Some__________Very little__________

Estimate the number of such persons you have hired during each of the following periods.

The past year_____ The past five years________ The past ten years______

Is the number of such graduates your company employs:

increasing__________ about stationary__________decreasing_______

Would you employ more of these graduates if available? Yes_____No____

If yes, in what job classification(s)?_____________________________________

____

____

____

____

Section C - Comments

Please give here any additional suggestions you have regarding the focal points of this questionnaire.

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